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ASPARAGUS

H. C. THOMPSON

Formerly Horticulturist, Office of Horticultural and Pomological Investigations

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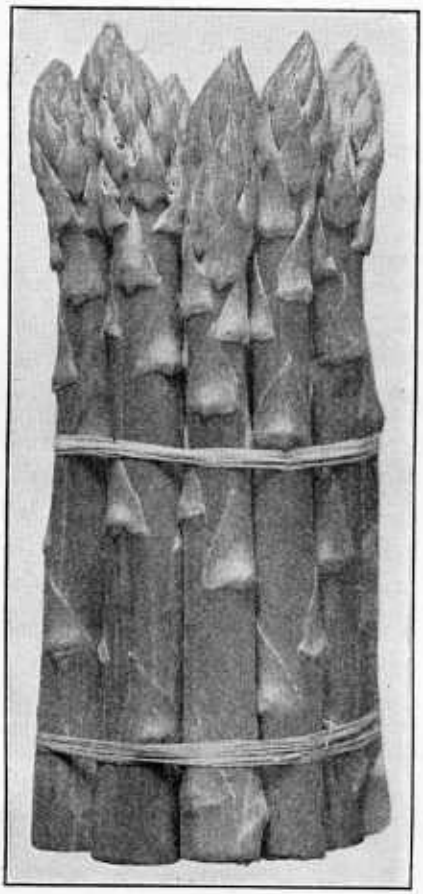

UNITED STATES
DEPARTMENT OF AGRICULTURE

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ASPARAGUS is one of the earliest and most wholesome vegetables and should be grown in every home garden where it can be produced successfully. As a canned product asparagus is one of the best, because it retains its flavor better than most other vegetables.

The growing of asparagus for market is a profitable industry when the crop is properly cared for and intelligently handled.

A well-established asparagus bed should produce profitable crops for 15 or 20 years, but in most instances better results are secured when the plantings are renewed every 8 or 10 years.

Contribution from the Bureau of Plant Industry

WM. A. TAYLOR, Chief

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ASPARAGUS.

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EXTENT OF THE INDUSTRY.

ASPARAGUS freshly cut and immediately served is one of the most delicate, wholesome, and appetizing products of the home garden. Its early appearance in the spring, together with the fact that an asparagus bed when once established will produce for many years, makes it of special importance in the home as well as in the market garden and on the truck farm.

The production of asparagus for market and for canning is an important industry. According to the Census Report of 1919 the area devoted to asparagus growing in the United States was more than 30,000 acres. California led in area, with 17,444 acres; New Jersey was second, with 3,603 acres; Illinois third, with 2,128 acres; Massachusetts fourth, with 1,157 acres; and South Carolina fifth, with 1,145 acres. These five States have a combined area of 25,477 out of the 30,239 acres on which asparagus is grown in the United States. While the acreage devoted to this crop is not large when compared with some of the vegetable crops its acre value is high, and asparagus can be looked upon as one of the important vegetable crops.

At the present time there is a strong tendency to increase the area devoted to asparagus, especially in sections where insufficient supplies have been produced to meet market demands.

SOILS FOR ASPARAGUS AND THEIR PREPARATION.

Asparagus can be grown on nearly all kinds of soil, but a sandy loam is preferred. Some of the muck lands of California, however, are considered ideal. In growing asparagus for home use the type of soil is not as important as a convenient location for the bed. As a rule, the home supply of asparagus is grown in the garden, which should be located near the house.

For the commercial planting of asparagus a light soil should be selected, because of its earliness and the ease with which the crop can be cultivated. If the soil is not naturally deep and well-drained it should be deeply plowed, subsoiled, and drained by means of tile or open ditches. On land that does not wash badly the soil should be plowed in the autumn or winter in order to get the benefit of freezing and thawing. Soil plowed in the fall should not be harrowed until spring. Where there is danger of serious erosion, plowing should not be done until spring. Before planting, the soil should be thoroughly pulverized by disking, harrowing, and planking or rolling. Stirring at frequent intervals until the asparagus is planted will keep down weeds and hold the soil in a loose, friable condition.

MANURES AND FERTILIZERS.

As asparagus is grown mostly on soils deficient in humus, barnyard or stable manure is the most valuable fertilizer. The manure adds both plant food and humus and increases the water-holding capacity of the soil. Where coarse manure is used on land to be planted to asparagus it should be applied broadcast at the rate of 20 to 40 tons per acre and plowed under, preferably in the fall. Well-rotted manure is usually applied after the land is plowed, and then thoroughly mixed with the soil by harrowing.

Where no manure is available it is a good plan to plow under some green crop during the season preceding the planting of the asparagus. Some leguminous crops, such as cowpeas, soy beans, or clover, should be plowed under if practicable, as these crops furnish both humus and nitrogen. Rye, oats, or any other grain crop will furnish humus and may be used where it is impracticable to grow a legume. The grain crops, however, do not furnish plant food that was not already in the soil.

In addition to the manure or cover crop it is advisable to use some commercial fertilizer, especially one furnishing phosphorus and potash. The manure does not furnish sufficient phosphorus and potash, and the cover crops where legumes are used do not provide any plant food except nitrogen. For an average asparagus soil 100 to 150 pounds of nitrate of soda, 500 to 1,000 pounds of 16 per cent acid phosphate, and 150 to 300 pounds of muriate of potash to the acre will give good results when applied in connection with manure or leguminous crops. Where no manure or leguminous cover crop is turned under, some additional nitrogen should be used in the form of cottonseed meal, tankage, dried blood, or fish scrap. The nitrate of soda furnishes available nitrogen for early growth, and the organic fertilizers supply the nitrogen for later needs.

In using large quantities of commercial fertilizer (1,000 pounds or more per acre) before planting the asparagus, it is best to apply it

broadcast. For amounts under 1,000 pounds it might be best to apply the fertilizer in the row or in a strip along the row. In either case the fertilizer should be thoroughly mixed with the soil by harrowing or cultivating.

After the asparagus plantation is established it should be fertilized every year. A common practice among market gardeners is to apply 20 to 40 tons of manure to the acre broadcast over the bed during the autumn or winter. This manure is usually disked into the soil early in the spring. In addition to the manure many growers apply nitrate of soda broadcast at the rate of 200 pounds to the acre. This practice is of doubtful value, as most of the plant food used in producing asparagus shoots is stored in the roots during the preceding season's growth. A better practice is to apply a good complete fertilizer at the rate of 1,000 to 1,500 pounds per acre at the end of the cutting season. For this application a fertilizer containing 2 to 4 per cent of nitrogen, 6 to 8 per cent of phosphoric acid, and 6 to 8 per cent of potash will give good results. Muriate of potash and kainit are preferable to sulphate of potash. Where the land is heavily manured the nitrogen may be left out of the fertilizer mixture. The fertilizer applied at the end of the cutting season should be distributed broadcast over the bed or in a strip on either side of the row and thoroughly mixed with the surface soils by harrowing or cultivating. It should be borne in mind that no amount of commercial fertilizer will make up for a deficiency in humus; in fact, large quantities of fertilizers are justified only where the soil is well supplied with humus.

It has long been believed by many growers that common salt is essential in asparagus growing. This belief is undoubtedly due to the fact that wild asparagus grows along the seacoast in soils containing considerable salt. Some growers and investigators believe that the chlorin in the salt is the valuable element, and this belief is apparently borne out by the fact that muriate of potash gives better results on asparagus than sulphate of potash. Where either muriate of potash or kainit is used, salt is not necessary, but in the absence of one of these it is advisable to apply 300 to 400 pounds of salt to the acre.

GROWING ASPARAGUS ROOTS.

Well-grown 1-year-old asparagus roots are best for planting purposes. These may be secured from a plant grower, a seedsman, or a nurseryman, or they may be grown at home. When the grower produces plants at home he can make his own selection, discarding all small, inferior roots and using only strong, healthy ones. In this way the development of the asparagus bed will be more uniform than where the plants are purchased and no selection is made. For grow-

ing the roots, a rich sandy or loam soil should be selected. The seed should be sown 1 to 2 inches apart in rows 15 to 18 inches apart for hand cultivation and 2½ to 3 feet apart if horse cultivation is to be given, and it should be covered to the depth of 1½ inches. After the plants are well established they should be thinned to stand about 3 inches apart, only the strongest plants being left in the row. Throughout the season the soil should be kept well cultivated and free from weeds.

PLANTING ASPARAGUS ROOTS.

In most sections of the country asparagus is usually planted in the spring, but in the South it is sometimes planted in the autumn. In the North spring planting is preferred, because roots planted in the autumn may be injured by freezing before they become well established. Where spring planting is followed, the roots should be planted as early as the weather and soil conditions will permit.

After the soil has been thoroughly prepared, deep furrows are opened by running a turnplow two to four times where each row is to be located. The rows should be about 4 feet apart for green asparagus and 5 or 6 or even 8 feet apart where white shoots are desired. The plants are set 15 inches to 2 or 2½ feet apart in the row, the greater distance being required for large-growing varieties on soil very rich in nitrogen. The roots or crowns should be set in the bottom of the furrow and covered to the depth of 2 or 3 inches at first, and the trench gradually filled up as the plants develop. The depth of soil over the crowns should be 6 to 8 inches in light soils and 4 or 5 inches in heavy soils. It should be borne in mind, however, that the crowns should not be covered to the extreme depth at first, as the young shoots might be smothered before they reach the surface.

Asparagus is sometimes grown without transplanting, the seed being planted in the row where the plants are to remain. It is claimed for this method that a year's time is saved, but this is certainly not true for all conditions, especially in the Northern States. Where this method is practiced, the seed should be sown one in a place 2 or 3 inches apart and the plants thinned to the desired distance as soon as they reach sufficient size. Ordinarily, the plants will get better attention the first year when grown in the nursery row. In addition to this, when the crowns are dug for transplanting the grower has a better opportunity to select strong, healthy plants than when the seed is planted in the permanent bed. Under most conditions it is best to grow your own plants in a bed and transplant them, or to obtain strong, healthy crowns from a reliable source and set them where they are to develop.

For a small home garden, asparagus roots are sometimes planted 12 to 18 inches apart each way, but this system is not very satisfactory. A better method is to plant one row across the garden, spacing the plants 15 inches apart in the row. If more than one row is necessary, the rows should be 3 feet apart, so that cultivation can be accomplished by means of horse or hand cultivators. Asparagus should be planted at one end or one side of the garden, where it will interfere the least with the plowing and preparation of that part of the garden used for annual crops.

CULTIVATION OF ASPARAGUS.

During the first season a crop of bush beans, peas, early cabbage, radishes, lettuce, or some other hoe crop may be planted between the rows of asparagus. Tall-growing or long-season crops should not be grown with asparagus. The cultivation required by the asparagus will be sufficient for most of the companion crops also, and the return from such a crop should go a long way toward paying the cost of growing both. Frequent shallow cultivations should be given to keep down weeds and to conserve the soil moisture. Some hand hoeing may be necessary to keep the soil loose and to control the weeds between the asparagus plants in the row.

FIG. 1.—A type of asparagus hiller that is used to a considerable extent in the asparagus-growing regions of California for renewing the ridges.

After the plantation has become established the soil should be thoroughly disked every spring. Where white shoots are desired, the soil must be mounded over the rows of asparagus in order to bleach the young spears. On a large plantation this is done by means of a plow, a disk harrow, or with an asparagus hiller similar to those shown in figures 1 and 2. The hilling is usually started in the spring, just as growth begins, and continues through the cutting season, as needed. For the production of green asparagus, level culture is practiced. With either system the space between the rows should be kept cultivated during the cutting season.

CARE AFTER THE CUTTING SEASON.

At the end of the cutting season the asparagus bed should be thoroughly cultivated and fertilized. The ridges should be leveled and flat culture given during the remainder of the growing season. Figure 3 shows a special implement used for plowing down the ridges. After the ridges have been leveled and the asparagus bed thoroughly cultivated, a good high-grade fertilizer should be applied at the rate of 1,000 to 1,500 pounds to the acre, as suggested under "Manures and fertilizers." The treatment given asparagus after the cutting season is over determines to a large extent the quality and quantity of the crop the following year. The plant food used in the production of shoots in the spring is manufactured in the foliage

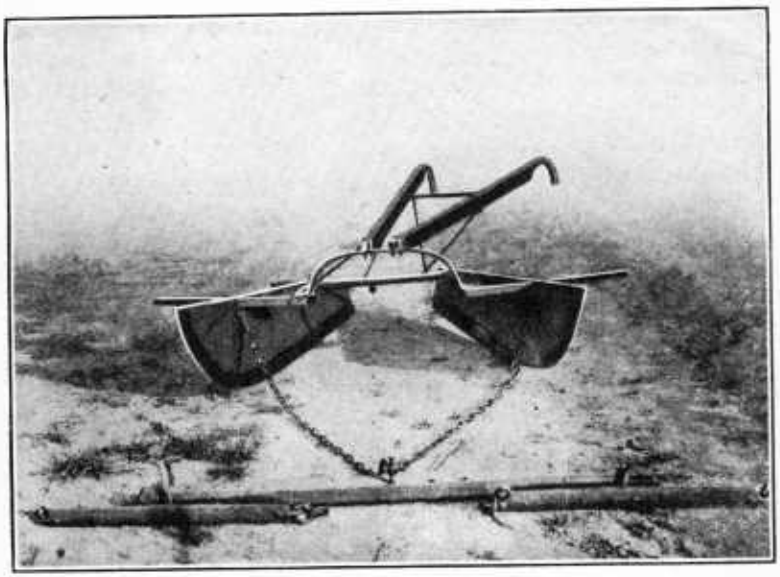

FIG. 2.—A homemade type of asparagus hiller which does very satisfactory work in renewing the ridges.

and stored in the roots during the previous season's growth. For this reason a strong, healthy growth of foliage is essential to a good yield of shoots or spears.

In many sections the asparagus plants are cut down as soon as the berries turn red, and after drying sufficiently they are burned, to destroy any disease germs or insects that may be present. In regions where severe freezes occur it is doubtful whether the plan of cutting and burning the asparagus tops is advisable. The old tops hold the snow and prevent deep freezing and the blowing of the soil. Some growers thoroughly harrow the bed after the tops are removed. In some sections a slight ridge is thrown over the row, but this ridging is not necessary unless there is danger of injury by severe freezing

during the winter. Where land is inclined to wash, cultivating and ridging in the fall are objectionable.

DURATION OF A PLANTATION.

The length of time an asparagus plantation will produce profitable yields depends upon the treatment it receives. A well-established bed which receives good cultivation and fertilization each year should produce profitable crops for 15 to 20 years. In practice, however, it is usually found desirable to renew the plantings every 8 or 10 years. When an old asparagus plantation produces nothing but small, spindling shoots it should be plowed up, a new bed having been started some years previous in another location.

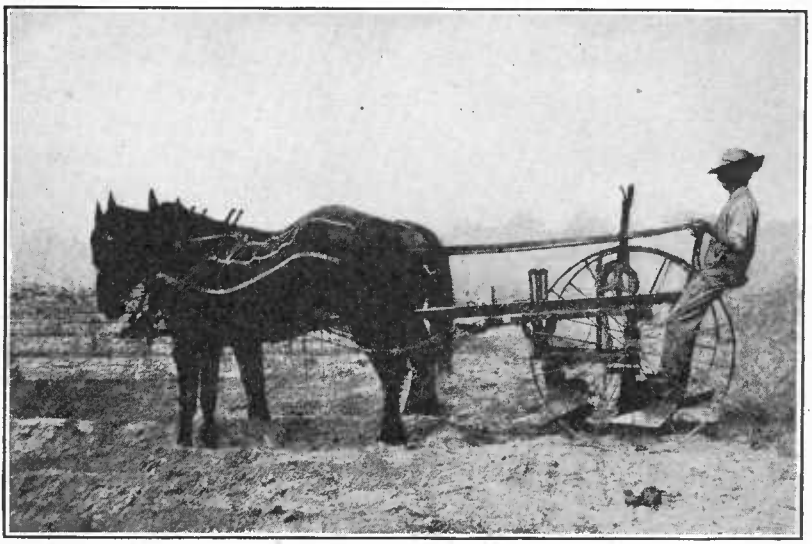

FIG. 3.—A type of implement used in plowing down asparagus ridges at the end of the cutting season.

HARVESTING AND PACKING.

During the first and second years of an asparagus plantation, no shoots should be removed, but at the beginning of the third year some of the crop may be harvested. Even during the third season, the cutting season should be short, as it is important to have large, well-developed crowns for the production of good asparagus.

Asparagus is usually harvested every day during the season, preferably in the morning; and when growth is very rapid it is often necessary to go over the plantation twice a day, especially where white shoots are desired. The cutting is done with a knife made especially for this purpose, similar to the one shown in figure 4. In cutting, one takes hold of the end of a shoot with the left hand and with

the right hand inserts the knife to the desired depth, severing the shoot with one downward stroke. Care should be exercised to avoid injuring other spears. After the spear is cut it is placed in a basket carried by the person doing the harvesting. When the basket is full, it should be taken to the packing house and the asparagus bunched as soon as possible.

If white asparagus is desired it is necessary to cut the shoots just as they force their way through the surface of the soil, as they become green on exposure to the air. In harvesting, white shoots are cut several inches below the surface of the soil. For green asparagus the shoots are cut a little below the surface of the ground.

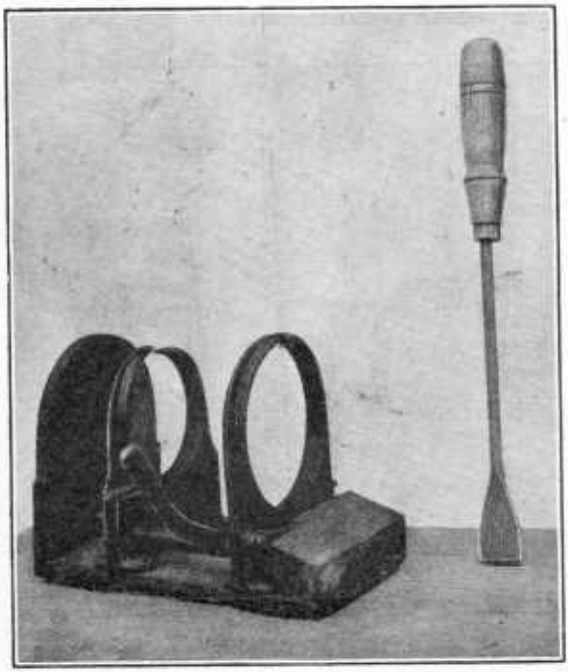

FIG. 4.—An asparagus buncher and an asparagus knife. Note that the cutting edge of the knife (chisel-like) is at the end.

As asparagus loses its quality quickly after it is harvested, the gardener who can put his product on the market within a day or two has a decided advantage over the grower living a long distance from the consuming center. For the very highest quality, asparagus should be cooked within a few hours after being cut; but this, of course, is impossible except where it is produced at home.

The shoots are usually taken to a packing shed, where they are graded, bunched, and packed. Some growers wash the shoots by dumping them into a tub or tank of water and stirring them a little by hand. They are then sorted into two or three grades, fancy or extra, primes, and seconds. The fancy, or extra, grade consists of large straight shoots of good length; primes are smaller shoots, but may be as long as the fancy grade; seconds consist of short or slightly deformed shoots. After separating the shoots into the different grades they are placed in a bunching machine with the heads all one way, only one grade being put into a bunch. When the bunching apparatus is full, the metal

clamps are closed by means of a small lever (as shown in fig. 5), and the asparagus is tied at each end with raffia or similar material. The butts are cut off evenly with a sharp knife and the bunches are often placed upright in a shallow tray containing about an inch of water. All the shoots in a bunch of extras or primes should be uniform in size and appearance. For a local retail trade it is an advantage to put up asparagus in small bunches that will retail at 5 to 10 cents.

The asparagus should be packed for shipment as soon as possible after it is bunched. Several different types of packages are used for asparagus, but a box similar to the one shown in figure 6 is perhaps the most common. These boxes are made to hold two to three dozen bunches set on end. The tops of these boxes are 3 or 4 inches narrower than the bottoms, thus preventing the bunches from shifting. A smaller type of box is used in some sections, especially for a fancy product. These smaller boxes usually hold 12 bunches set on end, as shown in figure 7. A common type of box is made with heads 15 inches wide at the top and 17 inches at the bottom, and with the side, top, and bottom slats 26 inches long. Some growers use the 32-quart strawberry crate and pack 24 or more bunches in each crate, the bunches being placed on their sides, as shown in figure 8. This type of package does not show off the asparagus to as good advantage as the asparagus box or crate. The boxes and crates are often lined with paper to prevent the excessive drying of the product. Some growers place a little damp moss in the bottom of the asparagus box and set the butt ends of the bunches on it in order to keep the cut surface from drying.

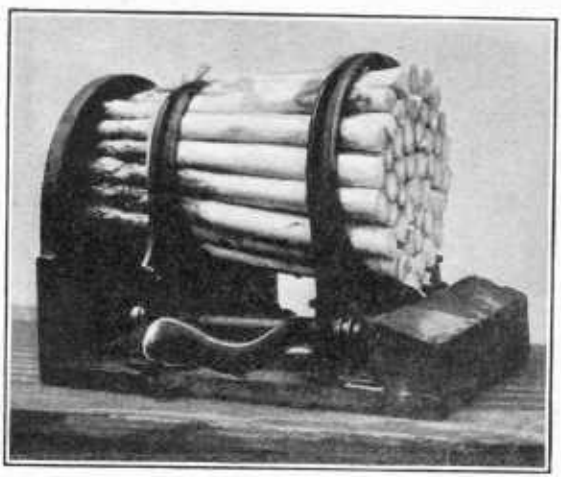

FIG. 5.—A bunch of asparagus in the device shown in figure 4. Note that the butts of the asparagus have been cut off.

ASPARAGUS VARIETIES.[1]

For the beginner, one of the most troublesome features of asparagus growing is the selection of a desirable variety or strain; in fact,

[1] Written by Mr. J. B. Norton, of the Office of Cotton and Truck Disease Investigations, Bureau of Plant Industry.

there are no uniform asparagus strains in existence. This is due to the constant mixture of blood lines caused by the necessary crossing in the field between the staminate and pistillate flowers, which in asparagus occur on separate plants. Some strains, through the more careful selection of seed plants, have a higher percentage of large shoots, produce a greater yield, or are more rust resistant than others. This advantage, however, is only one of percentage and is not possessed by each individual in the same degree. Bearing this in mind and realizing that the bed to be planted will last for many years, the importance of care in selecting a planting stock becomes apparent.

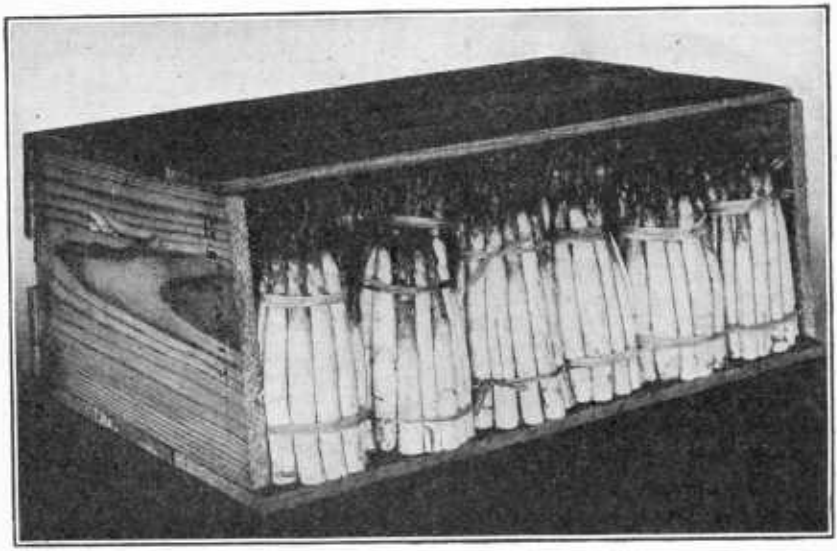

FIG. 6.—A large type of asparagus crate or box, having a capacity of two to three dozen bunches, depending on the size of the bunch.

In the following order, sources of stock are to be recommended: (1) Seed from the finest and largest plants in the best neighboring field when the variety is known to be rust resistant and otherwise satisfactory; (2) seed or roots of known origin from a reliable commercial grower; and (3) seed or well-grown 1-year-old roots obtained in good condition from reliable seedsmen when they are reasonably sure that the varietal name is correct. Reading Giant, Argenteuil, and Palmetto, in the above order, are three standard rust-resistant varieties. The first named is still reasonably pure, on account of its recent introduction. The last two names are applied by careless dealers to a great variety of stocks of uncertain pedigree and more uncertain performance. It is possible to get exceptionally good stock under many local names and also to find some of the

above-mentioned varieties suffering locally through the careless introduction of inferior sorts under a good name. Once a good strain is obtained, the surest way to get good stock for planting is through careful selection of home-grown 1-year-old roots that have been produced on a uniform field. By saving not more than the best 1 out of 10 roots a field of asparagus in which practically every plant produces large shoots can be assured.

ASPARAGUS RUST.

Asparagus is affected by a number of fungous diseases, the most destructive one being the asparagus rust. This disease appears on the plant as small reddish yellow spots on the main stem near the ground and on the branches and leaves. As the disease develops, the spots enlarge into patches until they cover the whole plant and give it a reddish brown or orange color, which becomes dark later in the season. The attacks of the disease cause the leaves to fall, and the plants present a naked appearance, as shown in figure 9. The effect of the disease on a field of asparagus is shown in figure 10.

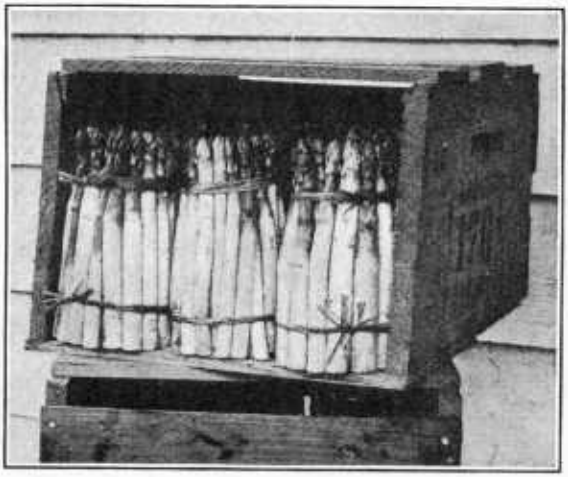

FIG. 7.—A small type of asparagus box, holding one dozen bunches.

The damage caused by the asparagus rust is not seen directly in the marketed product, but it reduces the crop by weakening the plants during the summer, after the cutting season is over. It is during this period that the plants store up food for the next spring, and if they are injured or broken off, the next season's food supply is diminished.

Spraying for the control of asparagus rust has been thoroughly tested by different agricultural experiment stations, but for various reasons growers generally have not taken up the practice. At the present time spraying is not considered a practical method for controlling this disease. The best method of controlling the rust is by the use of rust-resistant varieties and strains.

Norton,[2] in a discussion of rust prevention, writes as follows:

Although the breeding work being carried on with asparagus will eventually lead to the control of rust in commercial plantings, several years must elapse before this result will become effective. Meanwhile, it is necessary to take all measures practicable to prevent the destruction of existing fields of asparagus by the rust. To this end the main factor is to keep the rust away from the fields in summer just as long as possible.

As pointed out by Smith and others, wild asparagus growing around the borders of the fields, along fences, ditches, etc., is one of the worst enemies of the grower. These wild plants act as infection centers, and their influence can

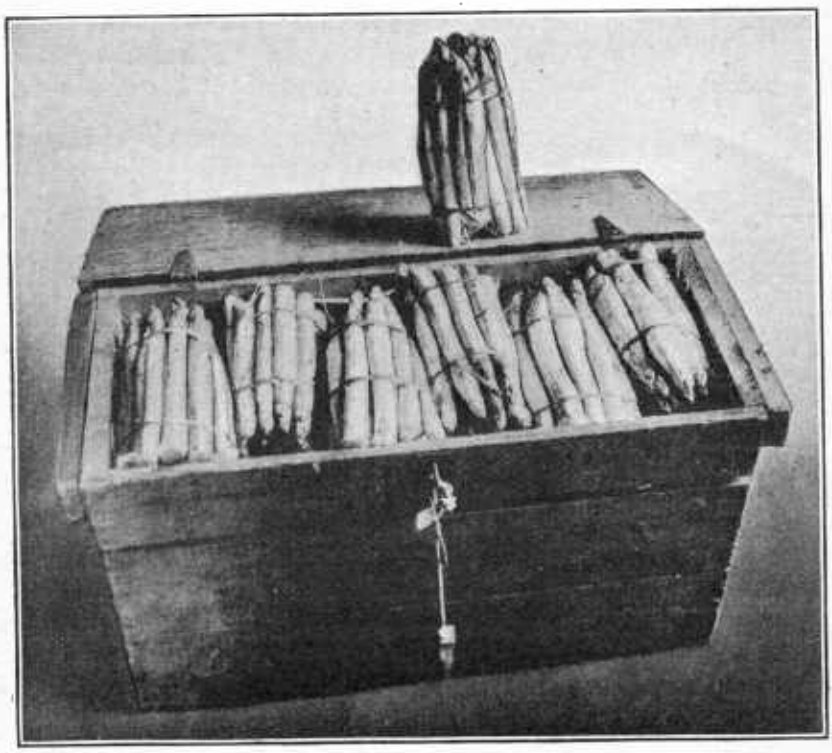

FIG. 8.—An asparagus box of the strawberry-crate type, with two dozen bunches of asparagus placed on the side.

be easily traced later in the season when the cutting beds have grown up. During the summer of 1910 the writer made an examination of the fields near Concord [Mass.] just at the time the rust was coming on and in every case of infection was able to trace the cause to asparagus plants that had not been cut up to the close of the infection period of the spring rust. When rust was found in a commercial field, by following it up to the northwest, the direction from which the prevailing winds come, a young bed, an old neglected bed, or wild asparagus was found in every case and always with the remains of cluster-cup infections. Wild plants wherever found should be dug up and burned. New

[2] Norton, J. B. Methods used in breeding asparagus for rust resistance. U. S. Dept. Agr., Bur. Plant Indus. Bul. 263, p. 59. 1913.

beds should be planted only at rare intervals of time, and then, if possible, where they will be to windward of a cutting bed. Keep the seedlings out of the cutting bed; at least let none stay in at the time the bed is allowed to grow up after the cutting season. Allow no poor shoots to grow up in the cutting field. In other words, keep down every shoot of asparagus until the middle of June in the latitude of Boston and see that neighboring farmers do the same. In the fall the tops should be removed carefully from 1-year-old beds that are not to be cut the next year. This will in a large measure reduce the liability of infection from this source.

The writer does not recommend the removal of tops from a mature bed in the fall. The ordinary practice in the vicinity of Concord is to leave the bed undisturbed in the fall, so that the tops will act as a winter cover and prevent the blowing of soil or snow. In the spring these tops are cut with a disk harrow. Fields in which this treatment had been used have been examined for spring rust after the bed had grown up at the end of the cutting season, but in no case have cluster cups been found. The Massachusetts station has at Concord a 3-acre fertilizer experimental plat on which plants have been infected

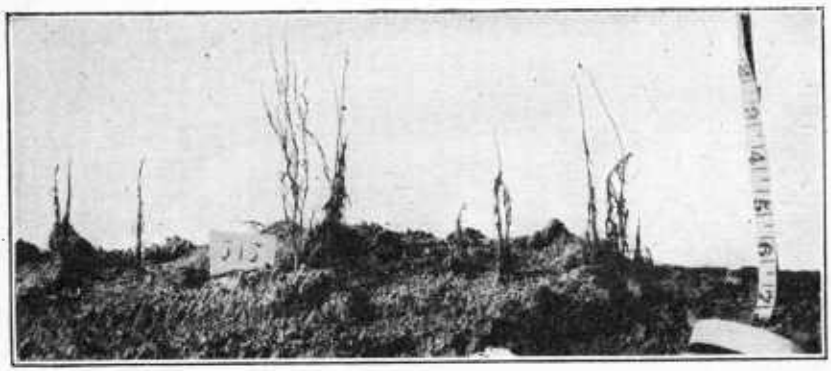

FIG. 9.—A seedling asparagus planting, showing the tops entirely killed by rust.

during 1909, 1910, and 1911 from young beds near by that were not being cut. No cluster cups were found in this 3-acre bed except on plants left for breeding purposes.

INSECTS.

The most important insects affecting asparagus are the common asparagus beetle, the twelve-spotted asparagus beetle, and the asparagus miner. These insects are widespread and sometimes cause serious injury to asparagus plantations.

For information in regard to asparagus insects, apply to the United States Department of Agriculture for Farmers' Bulletin 837, entitled "The Asparagus Beetles and Their Control," or write either to the Bureau of Entomology of the United States Department of Agriculture or to your State agricultural experiment station for specific instructions, submitting a specimen of the insect when practicable.

CANNING.

Asparagus is one of the most popular vegetables for canning, because the canned product retains the quality of the fresh shoots. In a few sections large acreages of asparagus are grown under contract for canners. In some cases the grower sells his asparagus through the ordinary channels as long as the price justifies it and then disposes of the remainder to the canning factory. The canneries tend to stabilize the market for fresh asparagus, and in some instances growers organize a company or association for the purpose of canning the surplus or disposing of the crop to advantage when the market price is too low to warrant shipping it long distances. The expense of shipping to canning factories is very small, because the cost of bunching, tying, and trimming is eliminated; cheap containers, which are returned and used repeatedly, are employed; the transportation charge is small, as the cannery is usually located near the producing center, to which the asparagus is often hauled direct from the field; and there is no commission or selling charge, as is the case when the crop is shipped to market.

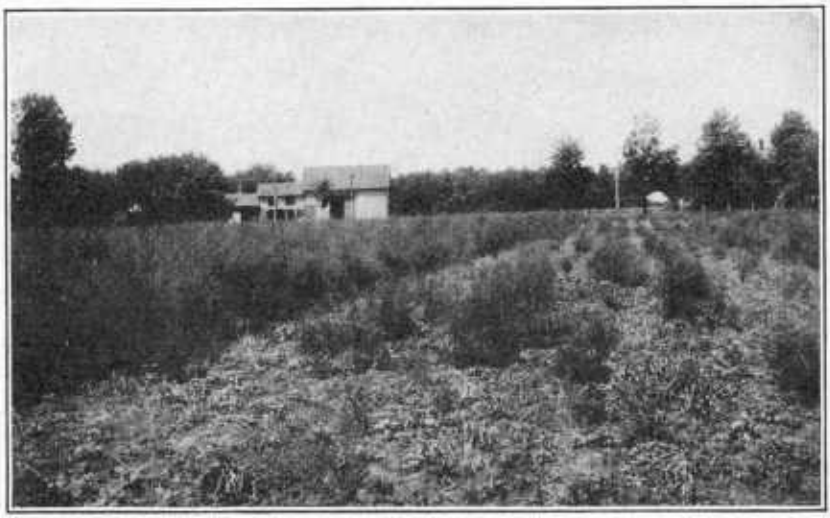

FIG. 10.—An old asparagus field killed out by rust. The new field of the Reading Giant variety on the left was grown as a breeding field for rust-resistance work.

As white asparagus is usually desired for canning, the shoots should be cut just before they show above the surface of the soil, as, after breaking through, only the green part is tender. The asparagus should be canned as soon as possible after it is harvested, because the longer the delay the tougher the shoots become.

For home use the asparagus should be canned within an hour or two after cutting. The stalks should be cut according to the length

of the can or jar to be used and then washed in cold water and the tough outer skin scraped off. The shoots should be blanched by immersing them in boiling water, butt ends down. The time required for blanching depends upon the condition of the shoots. For young, tender shoots a mere dip in boiling water is sufficient, while for the toughest stalks at least three minutes are required. After the asparagus is blanched, it should be plunged into cold water, packed neatly with tips up, in cans or jars, and covered with a heavy brine made by dissolving 4 ounces of salt in 1 gallon of water.

In canning in tin the No. 2 and No. 3 cans are used, the smaller size being preferred for tender asparagus. After the cans have been filled and the brine added, they should be capped and exhausted for two or three minutes in boiling water and then removed from the boiler or cooker and the small hole in the center of the lid closed. When using the hot-water method, the asparagus should be processed for two hours at the temperature of boiling water. A still safer method is to process for one hour each day on three successive days. When glass jars are used, the asparagus is blanched in the same way as for tin cans. The glass-top jar with a wire clamp is the best type to use for the intermittent process. After the jars are filled with asparagus, care should be taken to see that the rubber is in place. The lid should be put on evenly and both clamps raised, the upper one then being fastened in order to hold the lid in position. The same method of processing as that described for tin cans should be followed, and before removal from the boiler or cooker the jars should be sealed by pressing down the wire clamp at the side. In the intermittent process the clamp should be raised at the beginning of each processing. When screw-top jars are used the cap should be screwed about halfway down before beginning to process and tightened after each processing is completed. Glass jars should be placed on a rack in the cooker to avoid breaking. A wooden rack placed in the bottom of the receptacle is satisfactory.

When the steam-pressure method of canning is used, the asparagus is processed as follows:

No. 2 cans, 30 minutes at 240° F., 10 pounds pressure.
No. 3 cans, 45 minutes at 240° F., 10 pounds pressure.
Quart glass jars, 45 minutes at 240° F., 10 pounds pressure.

As the commercial canning of asparagus is a specialized industry requiring expert knowledge and considerable capital, it is not considered in this bulletin.

FORCING.

The forcing of asparagus for winter use is not practiced to any great extent in the United States, but in Europe it is of consider-

able importance. For forcing purposes 2-year-old crowns are considered best, and it is a good plan to grow them especially for this purpose. The seed should be planted in the same way as suggested under "Growing asparagus roots," but more space should be given to the plants, as they are to remain in the nursery row two years instead of one.

Asparagus may be forced by placing a cheap forcing house or hotbed over the rows in the field or by digging the crowns and removing them to a cellar or greenhouse. In building a forcing house over the rows in the field rough boards are used for the walls, and these are covered with a cheap grade of roofing paper. The roof is formed of hotbed sash. The houses are usually heated with steam or hot water, or by means of flues. Some growers depend upon the sun, but this means of securing heat is satisfactory only during the spring.

The most common method of forcing asparagus is to lift the crowns and place them under greenhouse benches, in hotbeds, or in cellars. When this method is used, the crowns are plowed or dug up late in the fall when the soil is moist, so as to have as much soil as possible adhere to them. They are then left exposed in the field until frozen, when they are covered with litter or removed to a shed in order to prevent alternate freezing and thawing. For a continuous supply of shoots throughout the winter the crowns should be stored in a cool cellar or pit until needed.

When ready for forcing, the crowns or roots should be brought to the cellar or other forcing place and bedded on 2 or 3 inches of loose soil on the floor. The clumps should be placed close together, the spaces between the clumps filled with loose soil, and the crowns covered to the depth of about an inch. The soil should be moistened thoroughly and kept moist all the time, but never allowed to become drenched. For white shoots the light should be excluded. When forced in the greenhouse the space under the benches is utilized, and the light can be excluded by boarding up the sides or hanging old carpets, burlap, or canvas over the openings.

For the first 10 days after the crowns are placed for forcing, the temperature should be kept rather low, 45° to 50° F. After this period a temperature of 55° to 60° F. is most satisfactory, although a higher temperature will not be injurious. A temperature as high as 75° to 80° F. produces a rapid, soft growth, while a low temperature produces a slow growth but gives shoots of good quality.

In about six weeks after bedding, the cutting can begin and will continue until the crowns are exhausted. As soon as the crowns become exhausted they should be removed and a new supply put in. With a little care in timing the bedding of the crowns, a continuous supply can be had all winter.

COST OF PRODUCTION AND RETURNS.

The cost of growing asparagus varies between wide limits, depending upon the value of the land, the method of securing the plants (whether grown from seed or bought from a plant grower), the method of culture, the kinds and quantities of fertilizers used, etc. In general, the cost of producing blanched asparagus is greater than for green shoots.

The cost of growing asparagus for the first two years should be charged against the crops harvested during the productive life of the bed; for example, if the plantation bears 10 commercial crops, one-tenth of the cost of the first two years should be added to the cost of production for each year. It should be borne in mind, however, that other crops may be grown between the rows for the first two years, thus reducing the cost of establishing the asparagus plantation. Vegetables are the best crops to grow between the rows of asparagus, because they are usually heavily fertilized and kept well cultivated.

By the best growers a yield of 1,500 to 2,000 one-pound bunches per acre is not considered very high, while some produce as many as 3,000 to 4,000 bunches. The average price in the Eastern States is 10 to 15 cents a bunch, but during the early part of the season the price is often two or three times these figures. Any good grower may expect a gross return of $150 to $300 per acre, and some exceed even the higher figure. Very few crops give larger returns for heavy fertilization, intensive culture, and expert handling. Whether the crop is grown at a loss or at a large profit depends largely upon the care and skill of the grower.

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